

REMARKS

Claims 1-9 are pending. To overcome the Examiner's objection to claims 1-9, claims 1-2 and 7-8 have been amended so as to clarify the subject matter thereof and claims 10-11 have been added as new claims.

Reconsideration of the present application is respectfully requested for the following reasons:

The rejection of claims 1-2 and 7-8 and under 35 U.S.C. 103(a) as being unpatentable over Goulanian et al (US 2005/0122549 A1) in view of Tanaka et al. (US 6,256,281) is respectfully traversed.

Applicant wishes to direct the Examiner's attention to the basic requirements for establishing a *prima facie* case of obviousness as set forth in the MPEP §2143. This section states that to establish a *prima facie* case of obviousness, three basic criteria first must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found

in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Further, MPEP §2143.03 states that all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

The present invention relates to a volume holographic digital data storage system comprising a light generator for generating a laser beam; a beam splitter for separating the laser beam into a signal beam and a reference beam; a SLM for modulating the signal beam into binary pixel data on a page-by-page basis based on data inputted from outside; a reduced reference beam providing means for transmitting a reduced portion of the reference beam as a reduced reference beam; and a lens having a plurality of incident locations for the reduced reference beam for refracting the reduced reference beam into a storage medium such that the reduced reference beam is projected toward one of the incident locations on the lens with the incident locations being spaced apart from each other to yield different refracted angles toward the storage medium with satisfied angular sensitivity. The angular

selectivity provides for the capability of distinguishing one page from another at an angular point of view.

Referring to Fig. 3, the reduced reference beam after passing through a lens 216 to the storage medium 230 is changed to a spherical wave with a different refracted angle. The refracted angles of the reduced reference beam are changed by changing each incident location of the reduced reference beam on the lens 216. This satisfies the angular selectivity to yield different refracted angles toward the storage medium. Therefore, it is possible to record a great number of holograms of binary data in a same spatial location in the storage medium on a page-by-page basis by changing the reduced reference beam from a plane wave into a spherical wave and by changing an angle of incidence of the reference beam on a storage medium.

More specifically, a plane wave (reference beam PS1 from the beam splitter 204) becomes a spherical wave after passing through a lens 216 with a different refracted angle which satisfies the angular selectivity in Fig. 3 in accordance with the present invention. By using the spherical wave and by changing the angle of incidence of the reference beam on the storage medium, various holograms can be recorded in a same spatial location (angular multiplexing), so that it is possible to increase the recording density of the storage medium.

On the other hand, Goulanian et al. teaches a method and apparatus for forming holograms of an object to preserve its 3-D characteristics using optical techniques controlled by a computer according to three-dimensional data from a computer database representing the object and recording the three-dimensional image. As shown in Figs. 7 and 8, a reference beam 74 becomes a spherical wave after passing through a focusing lens 85. The reference beam 74 is then converted to a plane wave 89 after passing through a collimating lens 88.

Further, as described in the paragraph [0198], an ensemble of an optical means is intended for changing the size of the reference beam and for parallel shifting the reference beam 74 with respect to itself and an axis of the collimating lens 88 and for orienting it in an established direction so that the plane wave reference beam 89 provides complete coverage of a corresponding area 51 of recording medium 50. Namely, the plane wave 89 shifts with respect to the axis of the collimating lens 88 so that the angle of incidence of the reference beam 89 onto the recording medium 50 is maintained constant. (See, each incident angle of the reference beam 89 to the areas 51 and 58 of the recording medium 89 in Fig 8.)

Furthermore, although the reduced reference beam 74 is projected toward one of the incident locations on the collimating lens 88, the incident locations cannot satisfy the angular selectivity since the incident locations yield same refracted angles toward the storage medium. Therefore, various holographic pages

cannot be recorded in a same spatial location according to Goulanian. Accordingly, angular multiplexing and shift multiplexing cannot be achieved by Goulanian.

Still further, Goulanian does not suggest or teach how to store a great number of holograms of binary data in the same spatial location in the storage medium on a page-by-page basis by using the reference beam as a spherical wave.

In contrast, in accordance with the present invention, the more the reduced reference beam having different incident location is projected into the lens with the angular selectivity being satisfied, the more various holograms can be recorded in a same spatial location. This permits storage of a substantial number of holograms of binary data in the same spatial location in the storage medium.

The cited Tanaka reference also uses a plane wave to record various holograms. Moreover, Tanaka only discloses spatial multiplexing. Accordingly, Tanaka does not overcome the deficiencies of the primary reference as discussed above, and one of ordinary skill in the art at the time of the invention could not have been motivated to combine the teachings of Goulanian with Tanaka for angular multiplexing and shift multiplexing using a spherical wave as a reference beam. Accordingly, the applicant respectfully submits that the amended claims 1 and 2 are allowable over the references cited.

It is also submitted that claims 7 and 8 which directly depend from claim 1 are allowable for the same reasons indicated with respect to the amended claim 1.

The rejection of claims 3-6 under 35 U.S.C. 103(a) as being unpatentable over Goulanian et al and Tanaka et al in view of Hays et al (PN. 5,777,760) is respectfully traversed.

Since claims 3-6 are directly or indirectly dependent upon amended claim 1, the claims are allowable for the same reasons indicated with respect to the allowance of amended claim 1. Moreover, because of the additional features recited in each of the dependent claims when taken alone and/or in combination with the features recited in the amended claim 1 are also believed to render claims 3-6 patentable over the cited references.

Claims 10 and 11 are new claims which depend from claim 1 and are believed patentable for the same reasons as given above.

CONCLUSION

Applicant believes that this is a full and complete response to the Office Action. For the reasons discussed above, applicant now respectfully submits that all of the pending claims are in complete condition for allowance. Accordingly, it is respectfully requested that the Examiner's rejections be withdrawn and that claims 1-11 be allowed in their present form.

Should the Examiner require or consider a further amendment to the specification, claims an/or drawings as necessary to place the case in condition for final allowance, the Examiner is invited to telephone the undersigned.

Respectfully submitted
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CERTIFICATE OF MAILING

I hereby certify that this *Preliminary Amendment w/RCE* are being deposited with the United States Postal Service via First Class Mail addressed to Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on March 1, 2006.


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